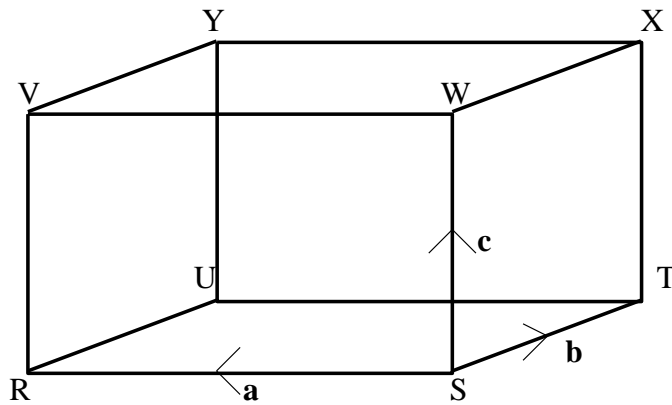


**National 5**

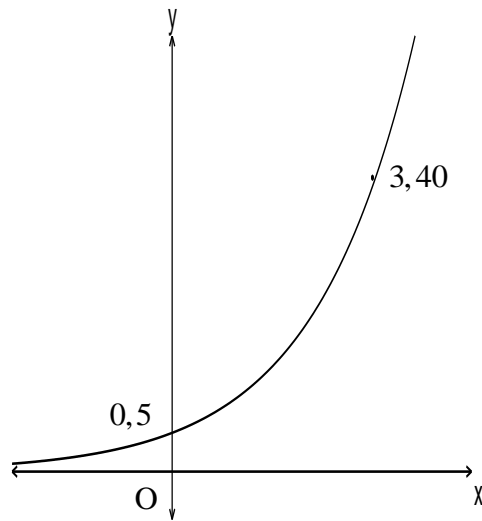
**Homework AP16**

1. In the diagram below RSTU, VWXY represents a cuboid.  
 $\overrightarrow{SR}$  represents vector **a**,  $\overrightarrow{ST}$  represents vector **b** and  $\overrightarrow{SW}$  represents vector **c**.



Express the following vectors in terms of **a** and/or **b** and/or **c**.

- (a)  $\overrightarrow{RT}$       (b)  $\overrightarrow{UX}$       (c)  $\overrightarrow{RX}$       (d)  $\overrightarrow{VT}$
2. Solve these trig equations for  $0 \leq x \leq 360$ .
- (a)  $4\sin x^\circ + 3 = 0$       (b)  $3\tan x^\circ = 2 - 3\sin 231^\circ$
3. Explain, using the quadratic formula, why the equation  $x^2 + x + 4 = 0$  has no real solutions.
4. The graph of the function  $y = a \times b^x$  is shown below. It passes through the points 0,5 and 3,40 .  
Find the values of  $a$  and  $b$ .



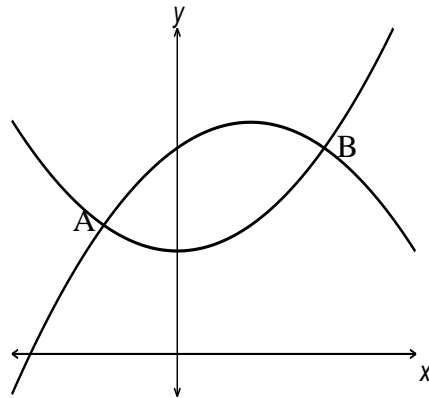
5. (a) Calculate the mean and standard deviation of the following set of numbers

13    17    21    24    25    26

- (b) Use your answers to (a) to **write down** the mean and standard deviation of

113    117    121    124    125    126

6. A tank contains 10 litres of water.  
A further 30 litres of water are poured into the tank at a steady rate of 5 litres per minute.
- Draw an accurate graph of the volume,  $V$  litres, against the time,  $t$  minutes.
  - Write down an equation connecting  $V$  and  $t$ .
7. The intensity of light,  $I$ , emerging after passing through a liquid with concentration,  $c$ , is given by the formula  $I = \frac{20}{2^c}$ ,  $c \geq 0$ .
- Find the intensity of light when the concentration is 3.
  - Find the concentration of the liquid when the intensity is 10.
  - What is the maximum possible intensity?
8. Simplify  $\frac{\sqrt{3}}{\sqrt{24}}$ , expressing your answer with a rational denominator.
9.
  - $F = f\left(1 - \frac{v}{s}\right)$ . Change the subject of this formula to  $v$ .
  - $M = 80 \times 2^{-t}$ . draw a graph of  $M$  against  $t$  for  $0 \leq t \leq 5$ .
  - Solve the inequality  $2 - 5 \leq 3x - 2 \leq 4 - 3x$
10. The sketch below shows the curves with equations  $y = 8 + 2x - x^2$  and  $y = x^2 + 4$ .



The curves intersect at points A and B.  
Find, algebraically, the coordinates of A and B.

11. Mello aftershave is sold in cylindrical cans. The manufacturer wants to change the dimensions of the can to produce a taller, slimmer can.  
The height of the can is to be increased by 30%. By what percentage must the radius be reduced if the volume is to remain the same?